main reading-rooms seat 400 or 500 readers; and the rooms of the Avery Collection and seminary rooms will accommodate several hundred more. The Duc de Loubat has made many other generous gifts to educational institutions, having founded professorships and scholarships in Berlin, Stockholm, Madrid, and the Universities of France and Italy. In America he has given valuable books and manuscripts to the University of Washington, University of Pennsylvania and Columbia; and at Columbia he founded the Loubat prizes of 1000 and 400 dollars, which are given annually for original work in various branches of science and art.

IN the House of Commons, on Tuesday, Sir John Lubbock called attention to the new Education Code, and the need of extending its provisions so that elementary science might be more widely taught in elementary schools. He moved: "That it is desirable to assimilate the provisions of the English Education Code, as regards class and special subjects, to those in the Scotch Code of 1897." Under the Code the subjects taught in elementary schools fall into three categories—the obligatory subjects, the class subjects, and the so-called specific subjects. The obligatory subjects are, in the case of boys, reading, writing, and arithmetic. The specific subjects comprise various sciences, domestic economy, and one or two languages. With the exception of domestic economy, however, they are not largely taken up. The class subjects are English, geography, elementary science, and history. Sir John Lubbock submitted that all these four subjects are essential. He did not propose to make them obligatory, but thought schools should be encouraged to take them up. So far from this, however, schools are actually precluded from doing so. The Code provides that no child shall be presented in more than two class subjects. If, therefore, a class took geography and elementary science, they must omit history and English. If they took history and English, then elementary science and geography must be omitted. Sir John Lubbock's contention was that this is a radically wrong system of education; that English, geography, elementary science, and history are all important subjects; and that the influence of the Education Department should be exercised not to prevent, but to encourage these being taken up in elementary schools. After a discussion, in the course of which it was pointed out that the whole difficulty is one of time, Sir John Lubbock withdrew his motion.

SCIENTIFIC SERIALS.

American Journal of Science, March.—Geothermal data from deep artesian wells in the Dakotas, by N. H. Darton. Nearly all the waters in the great artesian basin of the Dakotas are perceptibly warm. The author gives a chart showing the distribution of the wells according to temperature, which shows remarkable regional regularities. As regards the cause of the subterranean heat, the suggestion as to the oxidation of pyrites by underground waters is probably untenable on account of the depth. A collection of all available data will be necessary before a theory is attempted.—Examination of some triclinic minerals by means of etching figures, by T. L. Walker. Experiments may be made with etching figures to determine the equivalence of pairs of parallel faces. If parallel faces give different etching figures, the faces do not belong to the same crystal form. This thesis was proved by etching tourmaline with a red-hot mixture of potassium bisulphate and powdered fluorspar, and by etching axinite, cyanite, albite, and other crystals.—Some new Jurassic vertebrates from Wyoming, by W. C. Knight. The new species are called *Ceratodus robustus* and *Ceratodus americanus*.—Auriferous conglomerate of the Transvaal, by G. F. Becker. The workable area of the Witwatersrand is a strip of country a couple of miles in width and about thirty miles in length. The banket skirts the southerly edge of a large area dotted over with proclaimed gold-fields, in which ordinary veins are associated for the most part with crystalline schists. This area includes the northern part of the Transvaal and portions of Mashonaland and Matabeleland. Its extent is approximately 130,000 square miles. The banket is a highly siliceous mass, consisting of quartz pebbles embedded in a matrix composed of sand, pyrite, and other minerals, all cemented by secondary silica. The free gold in the matrix, like the pyrite, occurs in minute crystals or in irregular, sharp-cornered, hackly aggregates. The author inclines to the marine placer origin of the deposit, and believes that until the Lower Cape formation has been traced across the continent of Africa other spots as rich as the Rand may be hoped for.—A spectroscope without prisms or gratings, by A. A. Michelson. A kind of transmission grating may be made of plates of glass a few mm. thick, arranged with their edges in a step-by-step order. The results are comparable with those of the best gratings.

Annalen der Physik und Chemie, No. 1.—Canal rays, by E. Goldstein. The canal rays are so called from the manner of obtaining them by perforating the kathode. They form the yellow layer next the kathode, and when the latter is perforated straight yellow streamers pass through and fill the tube on the side away from the anode. These rays produce no phosphorescence, and are not in themselves deflected by a magnet. They form the prolongation of the kathode rays backwards, and converge when the latter diverge, and *vice versâ*.—Potential gradients in vacuum tubes, by W. P. Graham. The gradient along the tube was investigated chiefly by means of two electrodes mounted on a glass rod a small fixed distance apart. The glass rod was introduced into the tube through the Torricellian mercury column, and could be moved up and down. Maximum and mininum gradients were observed to correspond with the bright and dark strata of the positive light. But such fluctuations were also observed in the dark space itself. Minimum gradients were found to adjoin the two electrodes.—Coloured alkaline haloids, by E. Wiedemann and G. C. Schmidt. The authors endeavour to discriminate between the various theories advanced in explanation of the coloration of alkaline haloids by the kathode rays, and show that it is due not to a physical change, but a slight chemical reduction of the salts.—Determination of relative thermal conductivities by the isothermal method, by W. Voigt. The method devised by de Sénarmont for the investigation of crystalline conductivities may be considerably improved by adding elaidinic acid to the mixture of wax and turpentine. This gives very sharp curves. The method may be extended to the comparison of conductivities of various metals by constructing a rectangle out of two adjacent triangles of the metals in question, and pressing the shorter edge of the better conducting metal against a copper block kept at a constant temperature. The method admits of an accuracy of 2 per cent.—The optical constants of sodium, by P. Drude. The refractive index of sodium, as determined from the reflective properties of the metal contained in a spherical vessel in an atmosphere of hydrogen, is smaller than 0·054, which is the smallest value yet found for any metal. The standard NaK alloy comes next; and then silver with $n = 0{\cdot}18$.—Glow-worm light, by H. Muraoka and M. Kasuya Further experiments show that the photographic effect of glow-worm light is not due entirely to radiation, but partly at least to volatile substances inseparable from animal life. Resin and coffee, and certain metallic oxides, produce a similar effect, even when not in contact with the plate.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, February 17.—"On the Connection between the Electrical Properties and the Chemical Composition of different kinds of glass." By Prof. Andrew Gray, LL.D., F.R.S., and Prof. J. J. Dobbie, M.A., D.Sc.

In order to finally determine if possible the circumstances which affect the conductivity and specific inductive capacity of glass, several specimens of glass of special composition have been made up for the experimenters by Messrs. Schott and Co., of Jena, and by Messrs. Powell and Sons, of London. It had been previously found, by Prof. T. Gray, that potash and soda lime glasses had a higher conductivity than flint glasses—a result also arrived at by Dr. Hopkinson. Accordingly glasses richer in lead oxide than any formerly available, and in some cases practically free from soda, were made, so as to test whether diminution of the amount of soda and increase of lead oxide would still further diminish the conductivity. Specimens of glass used by Messrs. Schott, mainly in the manufacture of thermometers, were also obtained, as well as of a barium crown glass, not hitherto experimented on.

The conductivities were measured by the direct deflection method by placing the specimen (in some cases the bulb of a long-stemmed flask, filled up to the bottom of the stem with mercury, and immersed in a mercury bath; in others a plate silvered on its two faces) in series with a battery and a very sensitive high resistance galvanometer. The method of loss of charge was tried, but found for various reasons to be less suitable for the comparison immediately in view than that adopted. It is, however, the only method by which, for several of the specimens, results at ordinary temperatures can be obtained. Special care was taken to ensure that no disturbing film of moisture existed on the surface of the glass, and that the conduction was entirely through the plate or the walls of the flask experimented on.

The specific inductive capacities were determined by connecting the condenser formed by the specimen, for about 1/30,000 of a second, with one of Lord Kelvin's air leydens, which had been previously charged, and observing the potential of the leyden before and after the contact.

After the electrical determinations had been made the specimens were very carefully analysed, and the results are given in the paper, which contains, therefore, full information as to the precise composition of the glasses.

The anticipation mentioned above was fully borne out. The specific resistance of the lead potash glasses was for one certainly above $18{,}000 \times 10^{10}$ ohms at 100° C., for another above $35{,}000 \times 10^{10}$ ohms at all temperatures up to 135° C. The specific resistance of the barium glass was also very high; and, what was remarkable in this glass, there was hardly any trace of dielectric polarisation. The authors are pursuing experiments on the electrical and mechanical properties of this glass.

It was found, after the communication of the paper, that the almost complete replacement of the potash in a lead glass by soda diminishes the specific resistance.

The research is being continued with a view to settling a large number of interesting points which have arisen in the course of the work. For this purpose special glasses of as nearly as possible prescribed composition are being made by Messrs. Powell and Sons.

March 3.—"On Apogamy and the Development of Sporangia upon Fern Prothalli." By William H. Lang, M.B., B.Sc.

In this paper the results obtained from a series of cultures of ten species of ferns, the prothalli of which were grown for more than two years, are described. The conditions of cultivation differed from those under which prothalli usually occur in nature, in that fertilisation was prevented by avoiding watering from above; the prothalli were also exposed to direct sunlight. To these causes the results, which in the main agree for the various species, may be ascribed. The most important were the change in form and structure of the prothallus to a fleshy cylindrical process, which sometimes proceeded from the apical region, sometimes from the under surface just behind the latter; the development of conical projections around or in place of archegonia, and the occurrence of more or less numerous cases of apogamy in every one of the species. The latter phenomenon was manifested by the presence of tracheides in the tissue of the prothallus, by the development of isolated members of the sporophyte upon it, and, in every case but one, of complete vegetative buds. On prothalli of *Scolopendrium vulgare* and *Nephrodium dilatatum* sporangia, which sometimes attained almost perfect development, were found. In conclusion the bearing of the results on the nature of the alternation of generations seen in archegoniate plants is considered, and a provisional hypothesis is suggested to explain how the definite alternation of sexual and asexual forms might have originated by modification of individuals of the ancestral algal organisms under the conditions to which they would presumably have been exposed on their assumption of a terrestial mode of life.

"Experimental Observations on the early Degenerative Changes in the Sensory End Organs of Muscles." By F. E. Batten, M.D. Communicated by Prof. Victor Horsley, F.R.S.

The experiments described in the following paper were undertaken in order to show, firstly, that degeneration occurred in the first place in that part of the neuron most remote from the cell, and secondly, to reproduce within the muscle-spindle, if possible, certain changes which had been shown by the author to be present in the case of tabes dorsalis in man.

The results of the research have been to show:

(1) That within the muscle-spindle a spiral form of nerve termination exists surrounding a fine muscular fibre, in the centre of which are large, clear, non-nucleated cells.

(2) That changes take place in the spiral in twenty-four hours after section of the nerve, and that such changes become marked in forty-eight hours.

(3) That degeneration of the medullated sheath of the nerve takes place in the whole course of the nerve at the same time after section of the nerve.

(4) That no fatty change could be demonstrated in the intramuscular cells by the Marchi method similar to those found in the case of tabes dorsalis in man.

Entomological Society, March 2.—Mr. G. H. Verrall, Vice-President, in the chair.—Lord Walsingham exhibited a series of the larger and more striking species of Xyloryctinæ, a subfamily of the Gelechiidæ, especially characteristic of the Australian fauna. The series illustrated the life-histories and the great disparity in colour and form between the sexes of many species. He also gave an account of the family, chiefly from notes by Mr. Dodd (of Queensland), with especial reference to the habits of the larvæ, which live in holes in tree-trunks. to which they drag leaves in the night for the next day's consumption.—Mr. Gahan exhibited a locust, *Acrydium ægyptium* (= *tartaricum*), taken in a house in Hanover Square, and probably imported in vegetables.—Mr. Kirkaldy exhibited species of water-bugs, including *Enicocephalus culicis* and *Gerris robustus*, both taken for the first time in Mexico.—A discussion arose on the reported occurrence of the San José scale, *Aspidiotus perniciosus*, in Great Britain.

Linnean Society, March 3.—Dr. St. George Mivart, F.R.S., Vice-President, in the chair.—Mr. Thomas Christy exhibited specimens of the Mora Nut of British Guiana (*Dimorphandra Mora*, Schomb.), of which some had been lately introduced into London by Colonial brokers as the Kola Nut (*Cola acuminata*). It appeared, however, on analysis, that the former contains no caffeine, a product for which the latter is of definite commercial value. It remained to be ascertained whether the Mora Nut has any economic value.—Prof. W. A. Herdman, F.R.S., read a paper by Mr. F. J. Cole, entitled "Observations on the structure and Morphology of the cranial nerves and lateral sense organs of fishes, with especial reference to the genus *Gadus*." It contains the first description of the lateral-line organs of *Gadus*, and pit-organs were shown to be present. The author concludes that the lateral-line system of fishes was not originally metameric, and that it has nothing to do with the branchial sense-organs. He regards it and the auditory organ as parts of a system, and their nerves (viz. the superficial ophthalmic, buccal, external mandibular, lateralis, and lateral-line nerves), together with the auditory, as of a series *sui generis*, and shows that the so called lateral-line nerve of *Petromyzon* really belongs to the lateralis accessorius system (ramus lateralis trigemini, auct.), the morphology of which he fully describes. The paper deals exhaustively both with the afore-mentioned and the subsidiary branches of the subject, which is treated in detail and historically, with an accompanying exhaustive bibliography.—Prof. Howes, discussing the paper at some length, drew attention to some observations of the Cousins Sarasin, and to the experimental work of Sewall, Steiner, Lee and others upon the auditory apparatus of fishes. which he believed lent support to the author's conclusions.—Mr. G. Claridge Druce read a paper on the occurrence of *Carex helvola*, Blytt, in Britain, in which he gave an account of his discovery of this plant on Ben Lawers, Perthshire, in August 1897. He found it growing in some abundance at an elevation of about 3200 feet. Prof. Blytt and Dr. Christ, to whom specimens had been submitted, both agreed in naming it *C. helvola*, which by many botanists is considered to be a hybrid.—A report by the Rev O P. Cambridge, F.R.S., upon the spiders collected by Mr. Fisher, of the Jackson-Harmsworth Polar Expedition, was read by Mr. A. D. Michael. They consisted of three species, all belonging to the genus *Erigone*, one of which had been previously described, though not figured by Thorell; and another was new, but closely allied: the author proposes to call the latter *E. Fisheri*.

Geological Society, March 9.—W. Whitaker, F.R.S. President, in the chair.—Prof. J. W. Judd exhibited, on behal of the Coral Reef Committee of the Royal Society, the lowest core (698 feet) from the boring at Funafuti (Ellice Island), and drew attention to the remarkable changes exhibited by the rocks obtained at this depth. The core from this boring (a mass of material more than a ton in weight) had been sent to this country by Prof. Edgeworth David, and was now being submitted to careful study. The last 20 or 30 feet of the boring was carried on in a rock which was of a very soft character, and highly but minutely crystalline. Microscopic examination shows that the rock is almost completely converted into a mass of very small rhombohedra, the organic structures being nearly obliterated; while a preliminary chemical examination seems to indicate that magnesia has been introduced into the rock to a considerable extent. The complete study, microscopical and chemical, of all the stages of the change which has taken place in this rock—a study which will be undertaken by Mr. C. G. Cullis—promises to throw much light on processes of rock-formation of very great interest to the geologist.—Note on Clipperton atoll, by Rear-Admiral Sir W. J. Wharton, K.C.B., F.R.S. This atoll, 600 miles from North America, in lat. 10° 17′ N., long. 109° 13′ W., possesses a lagoon which is now completely cut off from the sea. In this is a perfectly round hole where soundings of 20 fathoms or more are reported, on the authority of Mr. Arundel, and even deeper ones on that of the captain of a merchant-vessel. On the coral ring there rises a mass of modified trachyte, the subject of the following communication, about 60 feet in height. The great depth of the lagoon and the rock-mass on the ring are not compatible with the origin of the reef by subsidence or outward growth; and the possible hypothesis is put forth that this reef had grown on the lip of a volcanic crater, or on an island, such as Krakatao, in which the interior has been enlarged and deepened by volcanic explosion.—A phosphatised trachyte from Clipperton atoll, by J. J. H. Teall, F.R.S. Specimens from the projecting rock described in the preceding communication are dark brown, white, or cream-coloured. The brown specimens are trachytes, composed of glassy phenocrysts of sanidine set in a groundmass of microlitic felspars with brown interstitial matter. The light-coloured rocks are more or less altered trachytes, in some of which the glassy phenocrysts of sanidine may still be recognised. Analyses of several specimens show that the rocks all contain varying amounts of phosphoric acid.—The Pliocene deposits of the East of England, Part i. the Lenham Beds and the Coralline Crag, by F. W. Harmer. From the discussion of lists of fossils, a large number of sections, and a series of borings, the author endeavours to establish a number of propositions with regard to the Lenham Beds, the Coralline Crag, and the Red Crag. His evidence indicates that the Lenham Beds are older, perhaps considerably so, than the Coralline Crag.

Mathematical Society, March 10.—Prof. Elliott, F.R.S. President, in the chair.—Mr. A. N. Whitehead read a paper on the geodesic geometry of surfaces in non-Euclidean space.—Prof. W. Burnside followed with a paper on linear homogeneous continuous groups whose operations are permutable.—Mr. T. I. Dewar, in the absence of Prof. Greenhill, F.R.S., exhibited, with the aid of stereoscopes, some stereoscopic diagrams of pseudo-elliptic catenaries and geodesics.—Lieut.-Colonel Cunningham, R.E., contributed a supplementary note on Aurifeuillians.—The President briefly brought before the meeting a paper, by Mr. W. F. Sheppard, on the calculation of the sum of the mth powers of a large number of magnitudes, and then (Lieut.-Colonel Cunningham in the chair) read a paper by himself, on the transformation of linear partial differential operators by extended linear continuous groups.

Zoological Society, March 15.—Dr. Albert Günther, F.R.S., Vice-President, in the chair.—A communication from Sir Edmund Loder, Bart., contained copies of some photographs of the Beaver-pond at Leonardslea, Horsham, and gave a short account of the habits of the animals as there observed.—Mr. R. E. Holding exhibited a pair of horns of the Sunga or Galla Ox of Abyssinia, and made some remarks on the horns of this and other varieties of the humped cattle of India and Africa.—A communication from Dr. G. Stewardson Brady, F.R.S., on new or imperfectly-known species of Ostracoda, chiefly from New Zealand, was read. It contained descriptions of the Ostracoda collected in New Zealand by Mr. H. Suter, for the Zoological Museum of Copenhagen, and by Mr. G. M. Thomson, of Dunedin. It also included a description of an Ostracod from the Bay of Bengal, presenting some remarkable peculiarities of the mouth-organs, and constituting the type of a new genus, which was proposed to be called *Eupathistonia*. Of the New Zealand species treated of sixteen were described as new, and the new generic term *Trachyleberis* was proposed for the reception of *Cythere scabrocuneata*, Brady.—Mr. E. H. J. Schuster described a new species of flagellate Protozoan, which he proposed to name *Lophomonas sulcata*. This species occurred as an endo-parasite in the upper part of the colon of *Blatta americana*, Linn.—Mr. J. T. Cunningham read a paper on the early post-larval stages of the Common Crab (*Cancer pagurus*), and pointed out the affinity of that species with the Circular Crab (*Atelecyclus heterodon*).—Mr. Oldfield Thomas read a paper on some mammals collected by the late Mr. Henry Durnford in 1877–8 in Chubut, Patagonia.—Mr. Martin Jacoby contributed an addition to our knowledge of the phytophagous Coleoptera of Africa by describing forty-three new species of the groups *Halticinæ* and *Galerucinæ*, specimens of which had been collected by Mr. Guy A. K. Marshall in Mashonaland and West Africa. Two new genera, viz. *Cheiridisia* and *Pseudedusia*, were characterised.

Royal Meteorological Society, March 16.—Mr. F. C. Bayard, President, in the chair.—A lecture on photographing meteorological phenomena was delivered by Mr. A. W. Clayden, who gave details of his experiences as Secretary of a Committee of the British Association. After referring to the extreme value of photographic methods of recording the movements of instruments, the lecturer spoke of the real importance of preserving photographic records of all sorts of unusual meteorological phenomena, and emphasised the necessity of companion photographs showing the same scene under normal conditions. It was suggested that meteorologists throughout the country should co-operate with the Royal Meteorological Society in securing such records. The phenomena of the lightning discharge, as distinguished from those of a single flash, were next described and illustrated by a number of lantern slides. Some of the puzzles offered by lightning photographs were next alluded to, and the lecturer stated that he had repeatedly found that a single discharge lasted several seconds. Mr. Clayden then spoke of the "black" flashes shown in photographs, and described the steps by which, some years ago, he was led to the proof that they were merely a photographic phenomenon, but one which still remains unexplained. Passing on to a consideration of cloud photography, the various methods in use were explained and a large number of lantern slides were exhibited, in some of which the clouds were shown on a background of blue sky in nearly their natural colours, a result obtained by the employment of suitable developers on a specially prepared plate. The method employed at Exeter by the lecturer for the measurement of cloud altitudes was fully described. This differs from all other methods in using the sun as a reference point. Mr. Clayden then spoke of the difficulty in getting good pictures of cirrus clouds, and described the methods dependent on the polarisation of the blue light of the sky, but expressed a conviction that polarisation had nothing to do with their efficiency, which was really due to a general lessening of brightness which enabled the exposure to be properly judged.

CAMBRIDGE.

Philosophical Society, February 7.—Prof. Newton, Vice-President, in the chair.—"The coral reefs of Funafuti, Rotuma, and Fiji, together with some notes on the structure and formation of coral reefs in general," J. Stanley Gardiner. The author had accompanied Prof. Sollas' expedition to Funafuti in 1896. Funafuti cannot be regarded as a typical atoll, as it shows an elevation of at least 10 feet. Its islands are the remains of the original reef, and are rapidly being washed away; while the present reef is extending outwards by nullipore growth, forming masses outside and joining them on to the *rim* In Viti Levu, Fiji, soft limestone attains an elevation of 900 feet and alternates with "soapstone," which the author regards as a shallow water deposit analogous to the sand covering the inner reefs round Viti Levu. Many of the islands of Lau are of hard limestone, and represent raised atolls. In the case of Vatu Vara a vertical thickness of 1030 is attained. Evidence is given to show that the Fiji Group has been stationary for a long period, and that the conditions and formation of its reefs strongly oppose the subsidence theory. It is also contended that reefs spread outwards on their own talus, while lagoons are formed by solution. Evidence for the latter is given from the washing away of the limestone islands of Lau, the atoll-reefs of which are considered to have been formed by this means. The formation of coral reefs is due rather to nullipore than coral growth, and depends largely on the depth to which light can penetrate sea water.—"Methods for the demonstration of 'connecting threads' in the cell-wall," Walter Gardiner. The author gives further details of his "Kolossow-Safranin" method, and describes a modification of Meyer's method, which he calls the "iodine-acid violet" method. The paper also deals with the theory of both of the above modes of investigation.

February 21.—Mr. F. Darwin in the chair.—On some differential equations in the theory of symmetric algebra, Prof. Forsyth.—Discharge of electrification by ultra-violet light, E. Rutherford. In this paper the general phenomena of conduction under ultra-violet light were considered, especially from the point of view of the nature and velocity of the carrier of the negative electrification. By directing a blast of air against a plate on which ultra-violet light fell, it was shown that the whole or portion of the carriers could be removed with the current of air. The charged gas so obtained shows properties similar to the charged gas obtained in Röntgen conduction. A general method of determining the velocity of the carrier was given. By its means the velocity of the carrier for air was found to be about 1·4 cms per sec. for a potential gradient of one volt per cm. The velocity of the carrier is independent of the metal on which the light falls, but depends on the gas surrounding the plates. The velocity of the carrier was found to be inversely proportional to the pressure, a result which shows the carrier is of molecular dimensions. The results of the experiments are simply explained on the hypothesis that gaseous ions are produced at the surface of the negatively electrified plate. The theory previously advanced that the discharge was due to the disintegration of metallic particles under the action of ultra-violet light does not sufficiently explain the facts.—Röntgen photographs of metallic alloys, C. T. Heycock and F. H. Neville. The authors exhibited and described photographs taken by means of the Röntgen rays through plates of alloy. As the two metals forming the alloy possess different degrees of transparency to these rays, the photographs show the separation of the metals that has taken place during the solidification of the alloy. For example, alloys of gold and sodium containing less than 30 per cent. of gold are seen to consist of well-developed, very transparent crystals, which must be pure, or nearly pure, sodium, imbedded in a mother substance which solidified last, and which, from its comparative opacity, evidently contains the gold. On the other hand, alloys containing more gold show very opaque needles of gold imbedded in a less opaque mother substance. This mother substance was the same as that in the first-mentioned alloy; it solidified after the needles of gold had been formed. Photographs of alloys of aluminium and gold, and of aluminium and copper, were shown, which exhibited similar phenomena. The crystals of aluminium in the alloy with copper were perfect rectangular crosses several millimetres in diameter. The gold-aluminium alloys showed a precipitate of Roberts-Austen's compound of the formula $AuAl_2$; the crystals were well-marked tubes and octahedra.

MANCHESTER.

Literary and Philosophical Society, March 8.—Mr. J. Cosmo Melvill, President, in the chair.—The President announced that the title of the Wilde Lecture to be delivered by Prof. Michael Foster on March 29, would be "On the physical meaning of psychical events."—Mr. Thomas Thorp exhibited some celluloid films taken from Rowland's gratings of 14,438 lines to the inch.—"On the velocity of sound in a tube, as affected by the elasticity of the walls," by Prof. H. Lamb, F.R.S. The paper consisted in an application of the known theory of the vibrations of thin cylindrical shells to the calculation of the velocity of sound in a tube filled with liquid. This subject has already been treated by Korteweg, but the author's method is somewhat different, and one or two collateral results of interest are obtained. The paper included, further, an approximate investigation of the effect in a *thick* tube.

EDINBURGH.

Royal Society, January 31.—Prof. Chrystal in the chair.—An obituary notice of the late Edmund Chisholm Batten was read.—Dr. J. K. Talmage, a delegate to the Geological Congress of 1897, gave in a report of the meetings.—Papers by Dr. Thomas Muir, on the relations between the co-axial minors of a determinant of the fourth order, and by Prof. Nanson on the Ellipse-Glissette elimination problem, being purely technical, were laid on the table.—Mr. W. L. Calderwood read a paper on the migratory movements of Salmonidæ during the spawning season. After distinguishing between spring and summer runs of fish and calling attention to the dissimilarity between such runs and the autumn runs to the head waters for the express purpose of spawning, the author showed that these last runs could alone be considered as analogous to the runs in connection with the spawning habit of *Clupea allosa*, *C. finta*, or *Petromyzon marinus*. As to the conditions of water flow which seemed most favourable for Salmonidæ entering a tributary from a main river, Mr. Calderwood submitted several tables of data collected by daily observations in the spawning season of 1896–97. The results showed that most fish entered the particular tributary under consideration when the water was in quarter-flood; that temperature had apparently no influence upon the runs of fish; that a limited number of fish ascended during normal flow of the stream; that the sea trout commenced to ascend later than salmon, but remained a much shorter period, completing their spawning two months before the last salmon redd was observed. The author exhibited a diagram-chart of the spawning grounds, showing the distribution of salmon and sea trout redds, and the dates on which the redds were constructed.

PARIS.

Academy of Sciences, March 14.—M. Wolf in the chair.—Chemical actions of the silent discharge. Nitrogen compounds in presence of free nitrogen, by M. Berthelot. A continuation of similar work published in preceding numbers of the *Comptes rendus*. The substances dealt with included methylamine, dimethylamine, ethylamine, propylamine, isopropylamine, allylamine, aniline, methylaniline, benzylamine, toluidine, pyridine, piperidine, ethylenediamine, propylenediamine, phenylenediamine, benzidine, nicotine, acetamide, thiourea, acetonitrile, benzonitrile, aldoxime, phenylhydrazine, some nitro-derivatives, pyrol and indol.—On the estimation of carbon monoxide diluted with large quantities of air, by M. Armand Gautier. Remarks on the use of iodic anhydride for the estimation of minute quantities of carbonic oxide (1 in 20,000). The reaction is complete at 60°, the iodine being collected upon a roll of reduced copper and weighed. Better results are obtained by determining the carbon dioxide produced. Acetylene also reacts with iodic anhydride, and ethylene, although not reacting itself at 60°, possesses the peculiar property of completely preventing the oxidation of carbon monoxide.—On the importance of sugar considered as a food; new demonstration of the superior nutritive value of sugar compared with that of fat, taking the respective thermogenic values of the two foods into account, by M. A. Chauveau. Two series of experiments were carried out upon the same animal (a dog), one with a sugar and the other with a fatty diet; the results showed that sugar possesses great advantage over the dynamically equivalent proportion of fat. It is, then, erroneous to consider the nutritive value of a food as measured by its heat of combustion.—The development of the sponges, by M. Edmond Perrier. A controversial reply to a paper on the same subject by M. Yves Delage.—The expedition to Greenland of the Geographical Society of Berlin, by M. Marcel Bertrand. The present note deals only with that part of the work which concerns the structure of the ice and the movements of glaciers. The explanation given for the latter, which satisfactorily accounts for all the observed facts, is practically identical with that proposed by Thomsen, the arguments now added by M. de Drylgaski rendering these views more precise.—On the theory of numbers, by M. H. Laurent.—Integral invariants and optics, by M. Hadamard.—On the laws of reciprocity, by M. X. Stouff.—On the transformation of Abelian functions, by M. G. Humbert.—The energy of an electrified system, considered as distributed in the dielectric, by MM. H. Pellat and P. Sacerdote.—On the electric conductivity of thin plates of silver, by M. G. Vincent. The films were deposited on glass, and the thickness, which varied between 38μ and 170μ, measured by the methods of Wiener and Fizeau. The results of the measurements fell practically upon a straight line for thicknesses down to 50μ, below which an inflexion of the line took place. This critical thickness agrees well with the number obtained by Quincke in his capillarity experiments.—Some properties of electric discharges produced in a magnetic field. Assimilation to the Zeeman phenomenon, by M. André Broca. The hypothesis of the existence of ions in incandescent gases is sufficient to coordinate all known facts relating to the radiation of incandescent gases and also those relating to the electric discharge in gaseous media.—On the barometric formula, by M. Alfred Angot. The assumptions necessary for the accuracy of the Laplace formula are not strictly fulfilled in actual practice, so that the heights of an experimental balloon determined by the barometer and by triangulation respectively, may differ by as much as 500 metres in a height of 11,000 metres.—On the haracters of the seasons of successive years, by M. P. Garrigou-Lagrange.—On the causes of the reciprocal replacement of two acids, by M. Albert Colson. An experimental study of the action of hydrogen sulphide upon the dry silver salts of orthophosphoric and pyrophosphoric acids.—On a new silicide of chromium, by M. Ch. Zettel. This silicide has the composition $SiCr_3$, and is obtained by strongly igniting in a Perrot gas furnace a mixture of copper, aluminium and chromic oxide. It is a well crystallised, very stable substance, which resists the action of all acids except hydrofluoric.—On a new method of fractionating the yttrium earths, by M. G. Urbain. The method consists of the fractional crystallisation of the ethyl sulphates. The results are similar to those obtained by the use of the acetylacetonates, the sulphates, and by the fusion of the nitrates.—On two modes of decomposition of some thiocyanic ethers, by M. Œschner de Coninck.—On some oxyethers of β-naphthol, by M. F. Bodroux. The ethyl, propyl, isopropyl, isobutyl, and isoamyl ethers are described.—On the product of oxidation of glycerine by the bacterium of sorbose, by M. Gabriel Bertrand. Dioxyacetone, $CH_2OH.CO.CH_2OH$, is the chief product; it was identified by means of its oxime.—On the sterilisation of liquids by filtration, by M. J. Hausser. Infusorial earth, calcined at 800° to 1000° C., powdered, and made into an emulsion with water deposits on any suitable filter support as a fine compact layer, which is capable of retaining the most minute suspended particles or micro-organisms. A thickness of ·4 to ·5 mm. is sufficient for sterilisation, and the velocity of filtration may be many times greater than with Chamberland filters.—The different modes of eliminating lime in rickets at different stages of the disease, by M. J. Babeau.—Embryogeny of the double larva of the Diplosomidæ, by M Antoine Pizon. The results of Salensky concerning the development of the branchio intestinal apparatus are confirmed, and in addition the function of the epicardial tubes is established.—On the splitting of the cuticle, by M. P. Pautel,—The culture of *Tricholoma nudum*, by MM. J. Constantin and L. Matruchot.—Action of different salts upon the structure of plants, by M. Charles Dassonville. The structure of true plants varies greatly according to the chemical composition of the medium in which they grow, those solutions which are most favourable to the development of the plant being also those which produce in it the greatest differentiation.—On a new generic type of Schizomycetes, the *Chatinella*, by M. E. Roze.

DIARY OF SOCIETIES.

THURSDAY, MARCH 24.

ROYAL SOCIETY, at 4.30.—The Bakerian Lecture will be delivered by Dr. W. J. Russell, F.R.S. Subject: Further Experiments on the Action exerted by certain Metals and other Bodies on a Photographic Plate.

ROYAL INSTITUTION, at 3.—Recent Researches in Electricity and Magnetism: Prof. J. A. Fleming, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Cost of Generation and Distribution of Electrical Energy: R. Hammond

INSTITUTION OF CIVIL ENGINEERS, at 4.—Prof. Boyd Dawkins will repeat the Sixth "James Forrest" Lecture on Geology in Relation to Engineering.

CAMERA CLUB, at 8.15.—Photographic Engraving in Intaglio: Colonel Waterhouse.

FRIDAY, MARCH 25.

PHYSICAL SOCIETY, at 5.—On the Circulation of the Residual Gaseous Matter in a Crookes' Tube: A. A. Campbell Swinton.—On some Improvements in the Roberts-Austen Recording Pyrometer, and Notes on Thermo-electric Pyrometers: A. Stansfield.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Internal Governor Friction H. O. Eurich.

MONDAY, MARCH 28.

SOCIETY OF ARTS, at 8.—The Thermo-Chemistry of the Bessemer Process: Prof. W. N. Hartley, F.R.S.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Exploration on and around Mount Aconcagua: E. A. Fitzgerald.

INSTITUTE OF ACTUARIES, at 5.30.—Industrial Assurance: C. H. E. Rea.

TUESDAY, MARCH 29.

ROYAL INSTITUTION, at 3.—Simplest Living Things: Prof. E. Ray Lankester, F.R.S.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Extraordinary Floods in Southern India: their Causes, and Destructive Effects on Railway Works: E. W. Stoney.

ANTHROPOLOGICAL INSTITUTE, at 8.30.—On the Natives of the Upper Welle District of the Belgian Congo: Captain Guy Burrows. (Illustrated with Lantern Slides and Objects of Ethnological Interest.)

WEDNESDAY, MARCH 30.

SOCIETY OF ARTS, at 8.—Telegraphy across Space: Prof. Silvanus P. Thompson, F.R.S.

THURSDAY, MARCH 31.

SOCIETY OF ARTS (Indian Section), at 4.30.—The Earthquake in Assam Henry Luttman-Johnson.

ROYAL INSTITUTION, at 3.—Recent Researches in Magnetism and Diamagnetism: Prof. J. A. Fleming, F.R.S.

CHEMICAL SOCIETY, at 3.—Annual General Meeting.

CAMERA CLUB, at 8.15.—Prof. Joly's System of Colour Photography: Captain Abney, C.B., F.R.S.

FRIDAY, APRIL 1.

ROYAL INSTITUTION, at 9.—Liquid Air as an Analytic Agent: Prof. Dewar, F.R.S.

BOOKS AND SERIALS RECEIVED.

BOOKS.—Results of Rain River, and Evaporation Observations made in New South Wales during 1896: H. C. Russell (Sydney).—The Mines of New South Wales, 1897: C. W. Carpenter (G. Robertson).—Fisiologia Vegetale: L Montemartin (Milano, Hoepli).—Anatomia Vegetale. Dr. F. Tognini (Milano, Hoepli).—Navigazione Aerea: G. N. Da Pra (Milano, Hoepli).—Storia Naturale: Dr. A Griffini (Milano, Hoepli).—Marriage Customs in many Lands: Rev. H. N. Hutchinson (Seeley).—Canada's Metals: Prof. Roberts-Austen (Macmillan).—Practical Guide to Photography: Marion and Co., 6th edition (Marion).—A New Astronomy: Prof D. P. Todd (New York, American Book Company).—Théories de L'Electrolyse: A. Minet (Paris, Gauthier-Villars).—Recherches sur les Origines de l'Egypte, Ethnographie Préhistorique et Tombeau Royal de Négadah: J. De Morgan (Paris, Leroux).—Laboratory Experiments on the Class Reactions and Identification of Organic Substances: Drs. Noyes and Mulliken, 2nd edition (Easton, Pa, Chemical Publishing Company).—The Freezing-Point, Boiling-Point, and Conductivity Methods: H. C. Jones (Easton, Pa, Chemical Publishing Company).—An Arithmetic for Schools: S. L. Loney (Macmillan).—Spectrum Analysis: Dr. J. Landauer, translated by Dr. J. B. Tingle (Chapman).—Sitzungsberichte der K.B. Gesellschaft der Wissenschaften, Math.-Naturw. Classe 1897, 2 Vols. (Prag).—The Linacre Reports, edited by Prof. E. Ray Lankester, Vol. 3 (Adlard).

SERIALS.—American Journal of Science, March (New Haven).—Psychological Review, March (Macmillan).—History of Mankind; F. Ratzel, translated, Part 24 (Macmillan).—Zoologist, March (West). Bulletin de l'Académie Royale des Sciences, &c, de Belgique, 1898, No. 2 (Bruxelles).—Journal of the Franklin Institute, March (Philadelphia).—Transactions of the Leicester Literary and Philosophical Society, January (Leicester).—Quarterly Journal of the Royal Meteorological Society, January (Stanford).—Bulletin of the Essex Institute, July–December, 1896 (Salem).—Board of Trade Journal, March (Eyre).—Timehri, December (Stanford).—Among British Birds in their Nesting Haunts: O. A. J. Lee. Part x. (Edinburgh, Douglas).—Proceedings of the Society for Psychical Research, February (Paul).—Wide World Magazine, April (Newnes).—Archives of the Roentgen Ray, February (Rebman).—Transactions of the Institution of Engineers and Shipbuilders in Scotland, March (Glasgow).—Morphologisches Jahrbuch, 25 Band, 4 Heft (Leipzig).

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